
DASYLIRION WHEELERI VAR. *Joseph E. Laferrière*²
DURANGENSE: A NEW
COMBINATION IN THE
NOLINACEAE¹

ABSTRACT

Fruits from 34 specimens of a single population of *Dasyllirion* from the Sierra Madre Occidental of Chihuahua, Mexico, were compared with those of herbarium specimens of *D. wheeleri* and *D. durangense* from outside the study area. Variation was found in this population spanning the range between the two taxa. It was concluded that *D. wheeleri* and *D. durangense* are conspecific, and the latter is reduced to varietal status. *Dasyllirion wheeleri* var. *durangense* is also reported for the first time from Sonora.

The genus *Dasyllirion* Zucc. is a member of the Nolinaceae with approximately 15 species native to Mexico and the southwestern United States. The plants are large, perennial, rosette herbs with strap-like leaves and flowering stalks up to 6 m tall. Various authors have merged this family with the Liliaceae or the Agavaceae (Cronquist, 1981), but more recent workers have supported separating the group as a distinct family (Dahlgren et al., 1985).

Trelease (1911) described several new species and varieties of *Dasyllirion* based largely on differences in the morphology of the three-winged, one-seeded samara. In particular, *D. durangense* Trel., a species described from a single specimen collected from Durango, Mexico, was said to have fruits "broadly elliptical-cordate, 7–8 × 9 mm," and the style "scarcely half as long as the rather open deep notch." This was contrasted with the more widespread *D. wheeleri* S. Wats. in Rothr., which was characterized by fruits "round-obovate, 6–7 × 7–9 mm, the style normally about equalling the open moderately deep notch." To date, only two publications have compared these two species, both of which have relied almost exclusively on Trelease's descriptions (Standley, 1920; Conzatti, 1947). The present analysis of a population in which both taxa occur sympatrically was conducted to ascertain the utility of the length of the style and the shape of the capsule wings in distinguishing *D. wheeleri* from *D. durangense* and to determine

whether the distinction between the two taxa should continue to be recognized at the species level.

MATERIALS AND METHODS

The site chosen for study on sympatric populations was the village of Nabogame, Chihuahua, Mexico. The town lies at 28°30'N, 108°30'W, approximately 1,800 m in the Sierra Madre Occidental, approximately 10 km east of the frontier with the state of Sonora. This site is ideal for such a study since plants referable to both *D. wheeleri* and *D. durangense* may be found growing within a few meters of one another. This is the most northerly location from which *D. durangense* has been reported in the literature (Fig. 1).

Fruits were collected from 34 individuals within 2 km of Nabogame. This sample represented the maximum number of individuals that could be collected within a two-week period. Most of the plants were located on extremely steep granitic slopes subject to less disturbance than other habitats in the area. Since the shape of the wings changes as the capsule matures, fruits were collected in December 1987, after they had fully dried. From each individual, ten fruits were selected for measurement on the basis of absence of insect damage and teratological deformities, and the presence of an unbroken style. Measurements were made as shown in Figure 2.

For comparison, herbarium specimens of *D.*

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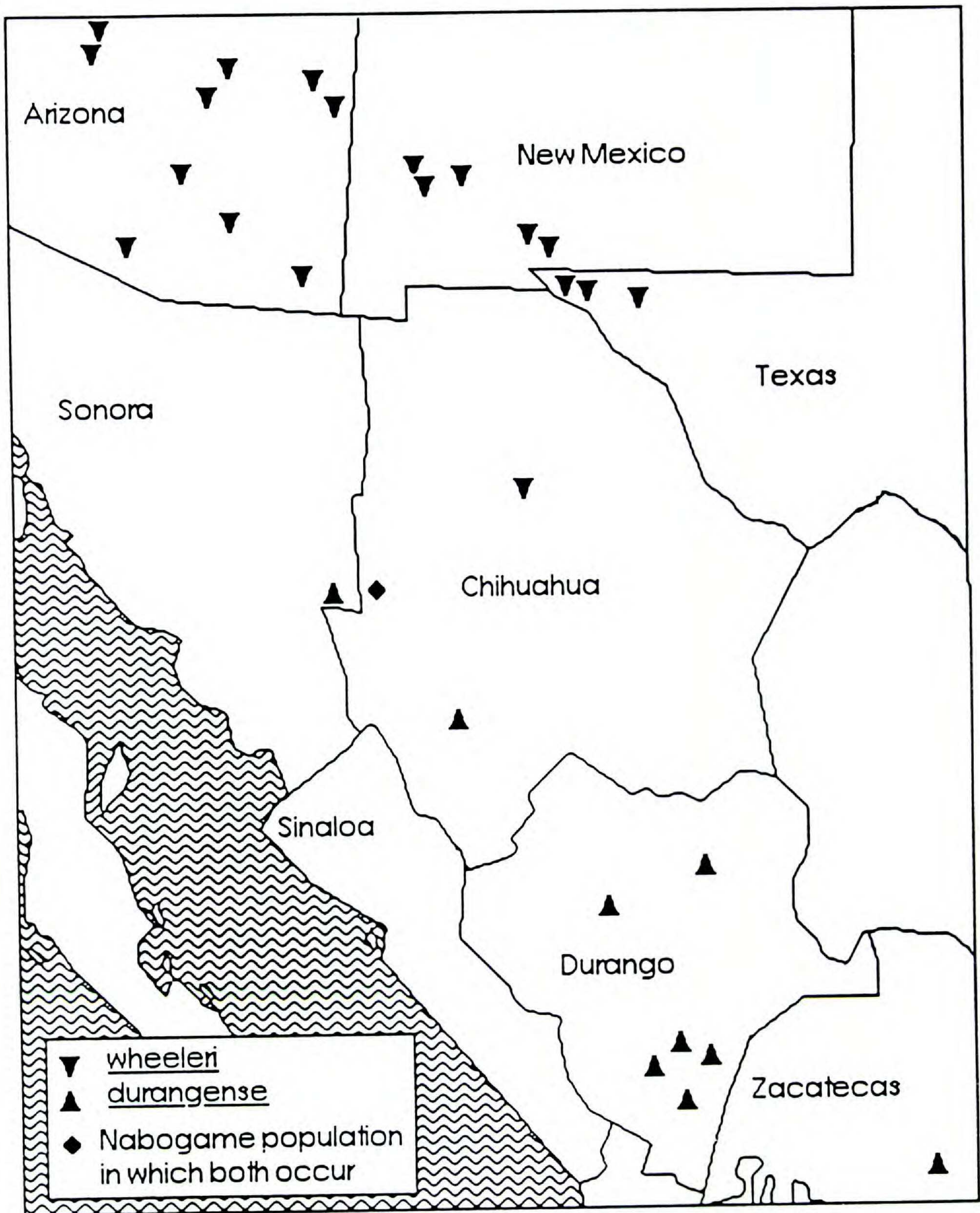


FIGURE 1. Map showing Nabogame and the distribution of *Dasyilirion wheeleri* and *D. durangense*. Diamond represents Nabogame population, where both taxa are present.

wheeleri and *D. durangense* from outside the Nabogame area were also measured. Fourteen specimens of *D. wheeleri* and six of *D. durangense* with mature fruits were examined, including both the type specimen of *D. durangense* and the one syntype of *D. wheeleri* with mature fruits. The same measurements were made on these specimens as on the fruits collected from Nabogame.

In addition, leaf and flower characters were examined on a much larger number of specimens,

but no consistent differences between the two taxa were noted. In particular, the size of the teeth and of the denticles between them, characters used by Trelease in his taxonomic discussions, varied widely in northern and in southern collections.

RESULTS

Averages and standard deviations of the three samples are given in Table 1. An analysis of vari-

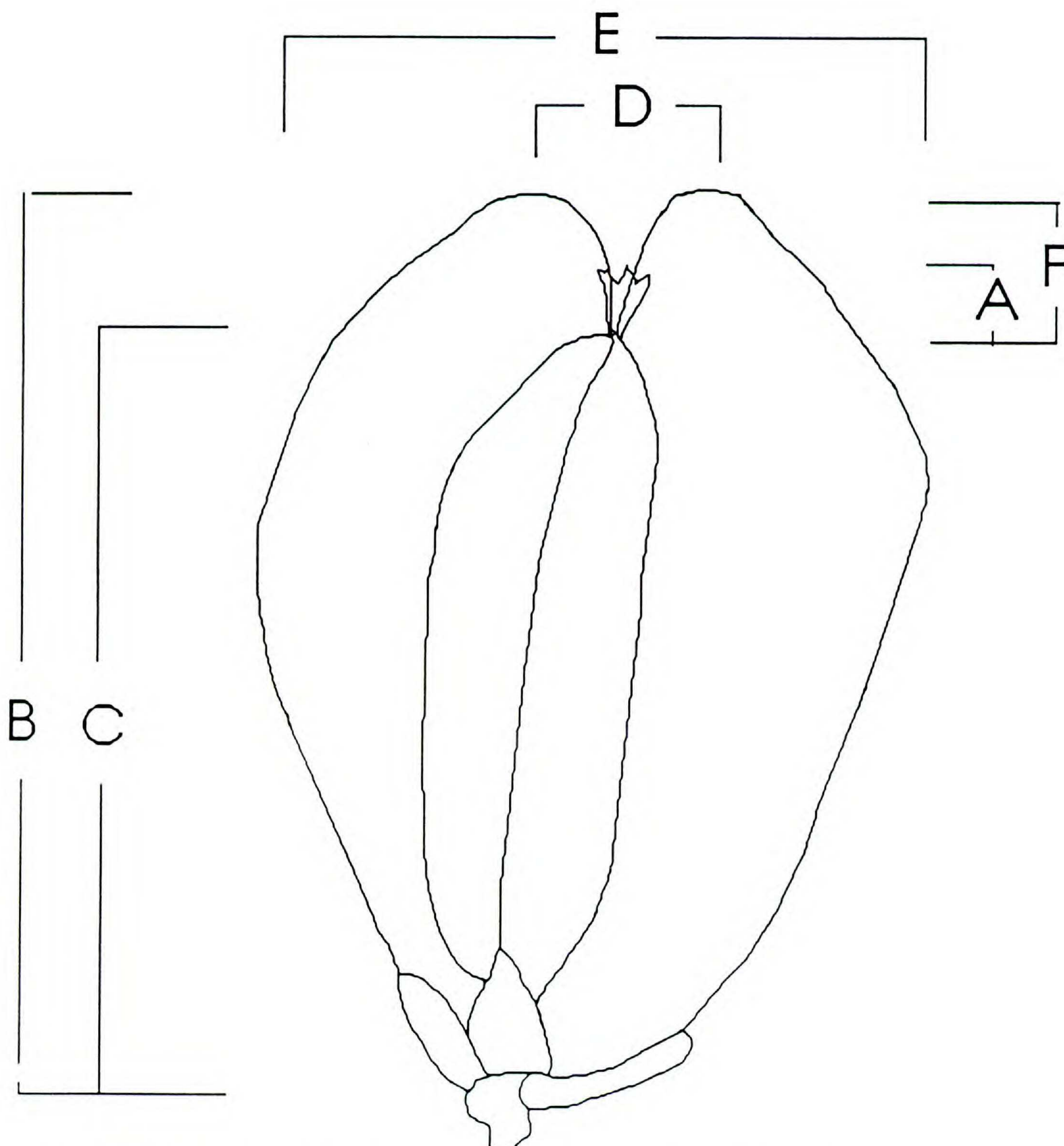


FIGURE 2. Drawing of capsule from type specimen of *Dasyilirion durangense* showing measurements made for statistical analysis. A represents the length of the style, B the length of the entire fruit, C the length of the main axis from the base of the fruit to the base of the style, D the width of the notch, i.e., the distance between the wings at their point of maximum distance from the base of the fruit, and E the maximum width of the fruit. From these measurements were calculated F, the notch depth, i.e., the height of the wings above the base of the style ($B - C$), and G, the ratio of the length of the style to the depth of the notch (A/F).

ance (ANOVA) test was performed on each of the seven characters; highly significant differences were found between the three samples at the 1% level for all seven characters. The data were subjected to a Newman-Keuls' specific comparison test to ascertain where the differences lie (Linton & Gallo, 1975); a Student's *t*-test yielded results identical

to those produced by the Newman-Keuls' test. Results are indicated in Table 1.

The data gathered from herbarium specimens showed statistically highly significant differences between the two taxa in three of the eight characters measured: total length, notch depth, and style/notch ratio. In addition, there was a signifi-

TABLE 1. Means and standard deviations of *Dasyilirion* fruit measurements. Data for *D. wheeleri* and *D. durangense* represent herbarium specimens collected outside the Nabogame area.

	<i>D. wheeleri</i>	<i>D. durangense</i>	Nabogame population
N	14	6	34
A (style length, mm)	0.80 ± 0.09	0.90 ± 0.10	0.95 ± 0.11**
B (total length, mm)	6.48 ± 0.78§§	8.36 ± 0.78**	8.29 ± 0.89**
C (axis length, mm)	5.54 ± 0.63	6.12 ± 0.79	6.25 ± 0.70**
D (notch width, mm)	2.39 ± 0.76	2.41 ± 0.44	3.94 ± 0.74**§§
E (total width, mm)	5.02 ± 0.95§	5.97 ± 0.66*	6.77 ± 0.79**§
F (notch depth, mm)	1.21 ± 0.38§§	2.24 ± 0.62**	2.04 ± 0.51**
G (style/notch ratio)	0.70 ± 0.17§§	0.26 ± 0.11**	0.53 ± 0.17**§§

*—Significantly different from *D. wheeleri* (5% level) using a Newman-Keuls' or a *t*-test.

**—Highly significantly different from *D. wheeleri* (1% level).

§—Significantly different from *D. durangense* (5% level).

§§—Highly significantly different from *D. durangense* (1% level).

cant difference in total width at the 5% level. The Nabogame data differ statistically from the *D. wheeleri* sample in all characters measured, even those for which the latter did not differ from *D. durangense*. Notch width and style/notch ratio showed highly significant differences between Nabogame and *D. durangense*, while total width showed a difference significant at the 5% level. Despite these statistical differences, for each character individuals in the Nabogame population exist which exhibit the characteristics of each of the two recognized taxa. Indeed, in every case the variation in the Nabogame population exceeds the entire range between the mean values for the two taxa.

In addition to the characters included in the statistical analyses, there is considerable variation in general wing shape, a character less readily quantifiable than those chosen for measurement. Similar variation is also apparent among the herbarium specimens. Most of this is between individuals, but some is between different fruits from the same plant.

DISCUSSION

The length of the style in fruit is useless as a diagnostic character. The shape of the wings may have some taxonomic value, but there is a great deal of phenotypic variation even within a single population. It thus appears that *D. wheeleri* and *D. durangense* should not be maintained as separate species.

It does seem desirable, however, to recognize *D. durangense* as a variety of *D. wheeleri*, in view of the consistent difference in notch depth between specimens from the southern part of the range and those from further north. Yet there is considerable variation and intergradation between the two taxa.

It is not known whether there exists a north-south cline connecting the two extremes or a narrow zone of intermediates in the area around Nabogame. In terms of notch depth, the Nabogame population appears more closely related to var. *durangense*, but it spans the range between the two extremes. Even in terms of notch width, the one character statistically separating the population from both of the recognized taxa, the variation is so great that if this one trait was used as a diagnostic character to describe a third variety, different individuals in the Nabogame population would be assignable to each of the three taxa. The notch-depth character singled out by Trellease is only part of a much broader variability than implied by his recognition of *D. durangense* as a distinct species.

TAXONOMY

In view of the preceding, the following change is indicated:

Dasyilirion wheeleri S. Wats. in. Rothr. var. ***durangense*** (Trel.) Laferrière, comb. et stat. nov. *Dasyilirion durangense* Trel., Proc. Amer. Philos. Soc. 50: 438. 1911. TYPE: *Palmer 557*.

The name "wheeleri" has precedence because it was first published in 1878 (Rothrock, 1878). The present paper is the first to report *D. wheeleri* var. *durangense* from Sonora (Gentry, 1972). The two varieties may be distinguished by the following key:

- 1a. Distal wing tips in fruit extending more than 1.5 mm above base of style var. *durangense*
- 1b. Distal wing tips extending less than 1.5 mm above base of style var. *wheeleri*

Selected specimens examined. **Dasyilirion wheeleri** var. **wheeleri**. MEXICO. CHIHUAHUA: Nabogame, 28°30'N, 108°30'W, 6 Dec. 1987, *Laferrière 1314* (ARIZ, MEXU, MO). SONORA: Río Bavispe, 30°20'N, 109°W, 11 Aug. 1940, *White 3234* (LL). UNITED STATES. ARIZONA: Cochise Co., 11 Nov. 1967, *Barr 67-437* (ARIZ); 2 Jan. 1983, *Yatskievych & Windham 83-03* (ARIZ); Gila Co., 16 Sep. 1973, *Engard 105* (ARIZ); Pinal Mts., Gila Co., 30 July 1892, *Toumey 449* (MO); Graham Co., Ash Creek, 1874, *Rothrock 655* (syntype) (MO); Greenlee Co., 7 Oct. 1942, *Wolf & Everett 11404* (ARIZ); Pima Co., 8 km E of Vail, 7 Sep. 1938, *Crooks, Thornber & Benson s.n.* (ARIZ); Pinal Co., Oracle, 9–13 Sep. 1905, *Thornber s.n.* (ARIZ); Mazatzal Mts., Tonto National Forest, 5 Nov. 1975, *Gentry & Gentry 23618* (ARIZ). NEW MEXICO: Grant Co., near Silver City, Aug.–Sep. 1911, *Holzinger s.n.* (MO); TEXAS: El Paso 12 km N of El Paso, 29 Sep. 1956, *Warnock 14255* (LL).

Dasyilirion wheeleri var. **durangense**. MEXICO. CHIHUAHUA: Nabogame, 28°30'N, 108°30'W, 15 Nov. 1988, *Laferrière 2268* (ANSM, ARIZ, MEXU, MO); Quirire, Mpio. Batopilas, 3 June 1984, *Bye, Davis, Randolph & Gerson 12854* (COLO). DURANGO: Durango City, *Palmer 557* (type) (MO, MEXU); km 249 on Highway 45 between Durango and Zacatecas, 24 July 1985, *Starr 903* (ARIZ); 9 km W of Cd. Durango on Highway 40, 6 Aug. 1975, *Gentry & Engard 23613* (ARIZ); 24 km E of La Zarca, on Highway 30, 26 July 1958, *Correll & Johnston 20223* (LL); km 40 Durango-Mezquital Highway, 22 Apr. 1982, *Gonzalez s.n.* (LL); Durango, July 1911, *Ochoterena s.n.* (MO); SONORA: Maicoba, June

1968, *Pennington 91* (LL). ZACATECAS: Zacatecas, *Marroquin s.n.* (MEXU).

LITERATURE CITED

- CONZATTI, C. 1947. Flora Taxonómica Mexicana, Tomo II: Monocotiledóneas Diferiantadas-Superováricas e Inferováricas. Sociedad Mexicana de Historia Natural, México, D.F., Mexico. [Reprint of a 1939 edition published privately in Oaxaca.]
- CRONQUIST, A. 1981. An Integrated System of Classification of Flowering Plants. Columbia Univ. Press, New York.
- DAHLGREN, R. M. T., H. T. CLIFFORD & P. F. YEO. 1985. The Families of the Monocotyledons: Structure, Evolution and Taxonomy. Springer-Verlag, Berlin.
- LINTON, M. & P. S. GALLO, JR. 1975. The Practical Statistician. Brooks/Cole Publishing, Monterey, California.
- GENTRY, H. S. 1972. The *Agave* family in Sonora. U.S.D.A. Agricultural Handbook 527.
- ROTHROCK, J. T. 1878. Report upon United States Geographical Surveys West of the One Hundredth Meridian, Volume VI: Botany. Washington: U.S. Government Printing Office.
- STANDLEY, P. C. 1920. Trees and shrubs of Mexico (Gleicheniaceae–Betulaceae). Contr. U.S. Natl. Herb. 23: 1–169.
- TRELEASE, W. 1911. The desert group Nolineae. Proc. Amer. Philos. Soc. 50: 404–443.